

Seed biology and ecology

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SEED ECOLOGY AND GERMINATION

Australian species can be grouped into those that store seeds in the plant canopy and those that release seeds into the soil seedbank. Species that retain their annual production of seeds on the plant in woody, protective fruits in the plant canopy, only releasing them after considerable time, are known as serotinous (or brady-sporous) species. Species of the Proteaceae, Myrtaceae and Casuarinaceae are examples of serotinous species. Seed release of serotinous species may occur with the death of the plant or branches supporting the fruits, or following a fire. The serotinous seed component in drier regions of Australia (e.g. the Western Australian kwongan) may contribute 1100 seeds/m² of soil surface.¹ Conversely, in the jarrah (*Eucalyptus marginata*) forest there is only a limited number of serotinous species (7 seeds/m²).

Plants that annually release seeds into the soil seedbank are known as geosporous. Species of the Mimosaceae, Apiaceae, Stylidiaceae and Ericaceae are geosporous.

For a plant community to regenerate from seed, the topsoil and canopy seedbanks need to be in a suitable physiological state to germinate and take advantage of narrow windows of opportunity for successful seedling establishment. Seedbanks within the topsoil or canopy may persist for varying periods of time and germinate either simultaneously in response to favourable germination cues such as fire, or intermittently with germination

events spaced over a period of time. Seeds of serotinous species are generally only shed when conditions are favourable for germination and seedling establishment. Therefore, these seeds are usually non-dormant and able to germinate immediately upon release.

Seeds of geosporous species are released each year into the soil seedbank and the risks associated with this simultaneous release into an unreliable environment are minimised through accumulation of several seasons worth of dormant seeds. Dormant seeds are those that do not readily germinate when provided with adequate moisture, appropriate temperatures, light and oxygen (for most species).

Dormancy is a state which delays seed germination until conditions are more likely to ensure seedling survival and continued reproduction of the species. Disparities between seed viability and germination percentages observed in research studies indicate that seed dormancy is pre-dominant in our flora, but largely confined to geosporous species as the seeds must be able to sense the environmental conditions to time germination for those periods when seedling establishment is likely. Incorporation of dormant seeds into the soil seedbank can be viewed as a 'bet-hedging' response to uncertain environmental conditions, such as moisture availability or variability in the frequency, intensity or duration of fire. Delaying seed germination until